

Acronyms

ASR	aquifer storage and recovery
CDL	commercial driver's license
CPI	Certified Pump Installer
CWD	Certified Well Driller
Decon	decontaminate/decontamination
DOT	Department of Transportation
EPA	Environmental Protection Agency
GPM	gallons per minute
GVW	gross vehicle weight
GW	groundwater
Haz-Mat	hazardous materials
HAZWOPER	hazardous waste operations and emergency response standards
MDL	minimum detection level
MGWC	Master Groundwater Contractor
OJT	on-the-job training
OSHA	Occupational Safety and Health Administration
P&C	property and casualty
PL	pumping level
PM	preventive maintenance
PM	project manager
PPB	parts per billion
PPE	personal protective equipment
PPM	parts per million
Pre-trip	DOT-required pre-trip inspection of truck
PSI	pounds per square inch
SW	surface water
SWL	static water level
TDH	total dynamic head

Worker Behaviors

Able to handle stress	Efficient	Open-minded
Appropriately dressed	Good personal hygiene	Optimistic
Common sense	Honest	Organized
Communicative	Imaginative	Persistent
Conscientious	Industrious	Professional
Courteous	Intelligent	Punctual
Dependable	Intuitive	Receptive
Detail-oriented	Mechanically inclined	Resourceful
Effective	Motivated	Self-confident
		Self-starter
		Team player

Tools, Equipment, Supplies, and Materials

Backhoe	Global positioning system	Sample bags
Bailers	Grout	Sample bottles
Blocking/cribbing	Grout pumps	Sample catcher
Bobcat	Hand tools	Sand/filter pack
Buckets	Inclination tool	Screens
Cable	Jars	Shale shaker
Casing	Jetting tools	Shoes
Casing locator	Landing clamps	Shovel
Compressors	Logging equipment	Slings
Crane	Lubricants	Stabilizers
Desanders	Marsh funnel	Stem
Develop/rehab chemicals	Measurement equipment	Sub adaptors
Disinfectants	Mud additives	Support truck
Dog house	Mud balance	Surge block
Downhole hammer	Mud gun	Swab
Drill bits	Mud mixer	Test pumps
Drill collars	Mud pumps	Thermometer
Drill fluids	Orifice	Torch
Drill pipe	Packers	Trencher
Drill rig	Personal protective equipment	Video camera
Drill stem	Pickup	Water
Drive head	Portable mud pit	Water meter
Elevators	Portolet	Water test kit
Fishing tools	Reports/logs/forms	Weir
Forklift	Rope socket/mandrel	Welder
Generators		Wrenches

General Knowledge and Skills

Active listening	Management of personnel resources
Building and construction	Math skills
Chemistry	Mechanical skills
Complex problem solving	Monitoring
Coordination	Operation and control
Critical thinking	Personnel and human resources
Customer and personal services	Physics
Design	Public safety and security
Engineering and technology	Quality control analysis
Equipment maintenance	Reading comprehension
Equipment selection	Repairing
Geology	Science (geology)
Installation	Speaking
Instructing	Time management
Judgment and decision making	Transportation
Law and government	Troubleshooting
Management of material resources	

DACUM Research Chart

Drilling Contractors and Operators

Research Panel

John Henrich, MGWC/CVCLD
President
Bergerson-Caswell Inc. Maple Plain, Minnesota

Gary L. Hix, CWD/PI
Owner
In2Wells LLC
Tuscon, Arizona

Rod E. Jenkins, CWD
Owner/Operator
Hall and Jenkins Well Drilling
New Carlisle, Ohio

Ron McAfee, CWD/PI/CSP-II
Owner
The Water Mechanic
Clover, South Carolina

Ernest Pender, MGWC President
Pender Water Wells
Texarkana, Texas

Roger E. Renner, MGWC
President/CEO
E. H. Renner & Sons Inc.
Elk River, Minnesota

Steve Schneider, MGWC
ice President
Schneider Water Services
St. Paul, Oregon

Research Facilitators

Robert E. Norton
CETE/OSU

Erich Fein
CETE/OSU

Sponsored by



Phone (800) 551-7379 or (614) 898-7791

Fax (614) 898-7786

Websites NGWA.org and WellOwner.org

Address 601 Dempsey Road, Westerville, Ohio 43081-8978 U.S.A.

Research Facilitators

Center on Education and Training for Employment
College of Education
The Ohio State University
1900 Kenny Road
Columbus, OH 43210-1090

June 10-11, 2003

DACUM Research Chart for Drilling Contractors and Operators

Duties	Tasks															
A Assess Client Needs	A-1. Respond to client inquiry	A-2. Collect client information	A-3. Determine client needs (e.g., water supply, decommission, time schedule, rehab)	A-4. Conduct site assessment (e.g., access, set-backs)	A-5. Explain construction options to client	A-6. Provide verbal cost estimate	A-7. Assess client payment ability									
B Develop Project Plan	B-1. Research geological/hydrological conditions (e.g., well records)	B-2. Determine proposed well structure	B-3. Determine equipment needs	B-4. Estimate material needs	B-5. Determine contractual terms and conditions	B-6. Estimate human resource requirements	B-7. Formulate project/time schedule	B-8. Estimate contractor costs	B-9. Prepare written proposal	B-10. Execute contract (e.g., sell, close)						
C Initiate Project Plan	C-1. Obtain required permits (e.g., notices of intent, start cards, notifications)	C-2. Obtain bonds and insurance	C-3. Prepare project specific submittals (e.g., health and safety plan)	C-4. Order project materials	C-5. Determine well location	C-6. Participate in preconstruction meeting	C-7. Schedule rig and equipment	C-8. Schedule project crew(s)	C-9. Brief drilling crew	C-10. Schedule subcontractors	C-11. Notify inspectors (e.g., regulators, engineers)	C-12. Locate underground utilities				
D Mobilize for the Site	D-1. Prepare drilling equipment (e.g., pre-trip, safety, preventive maintenance)	D-2. Load tools and materials	D-3. Deliver tools and materials	D-4. Prepare site for crew (e.g., postings, portolet, communications)	D-5. Prepare site for equipment (e.g., leveling, fencing, excavation)	D-6. Set up equipment	D-7. Establish adequate water supply	D-8. Conduct tailgate meeting (e.g., safety issues)								
E Construct Water Well	E-1. Perform equipment maintenance and startup (e.g., inspect drill bit)	E-2. Prepare drilling fluids	E-3. Drill borehole (e.g., underreaming)	E-4. Install casing and shoe	E-5. Collect geologic samples	E-6. Analyze geologic samples	E-7. Perform geophysical logging	E-8. Install liner assembly	E-9. Install screen assembly	E-10. Install filter pack	E-11. Perforate casing	E-12. Pull back casing	E-13. Manage drill cuttings and fluids	E-14. Perform plumbness and alignment test	E-15. Remove temporary casing	E-16. Seal casing in place
F Rehabilitate Wells	F-1. Determine existing well construction	F-2. Determine water chemistry	F-3. Remove pumping equipment	F-4. Videolog the well	F-5. Modify treatment plan	F-6. Implement well development plan	F-7. Perforate casing									
G Develop Wells	G-1. Install development tools and equipment	G-2. Manage development chemicals	G-3. Agitate screened production zone (e.g., jetting, swabbing, rawhiding)	G-4. Agitate open-hole production zone (e.g., blasting, air development)	G-5. Monitor sediment removal	G-6. Monitor well performance	G-7. Manage discharge water	G-8. Perform pump test	G-9. Sample water quality	G-10. Disinfect the well	G-11. Install sanitary cover					
H Decommission Wells	H-1. Determine existing well construction	H-2. Videolog the well	H-3. Clear well to required depth	H-4. Prepare casing and liner (e.g., perforate, remove)	H-5. Disinfect well to be decommissioned	H-6. Install abandonment material (e.g., grout, gravel)										
I Demobilize the Site	I-1. Create down-hole videolog of well	I-2. Load tools and materials	I-3. Tear down equipment (e.g., decon equipment)	I-4. Dispose of drill cuttings and fluids	I-5. Perform site restoration	I-6. Install well-head protection	I-7. Transport equipment and materials									
J Close Out Project	J-1. Document well construction (e.g., reports, well logs)	J-2. Distribute well construction documentation (e.g., regulatory, client, contractors)	J-3. Close out contract (e.g., clear punch list)	J-4. Process final invoice	J-5. Process supplier and subcontractor invoices	J-6. Evaluate project performance	J-7. Analyze project profit or loss	J-8. Market additional services (e.g., service plan)								
K Manage Business Activities	K-1. Manage financial resources	K-2. Manage human resources	K-3. Obtain business licenses and business permits	K-4. Maintain insurance coverage	K-5. Maintain external professional relationships	K-6. Maintain company facilities (e.g., clean up shop, plow snow)	K-7. Manage supplies and materials	K-8. Comply with regulatory standards (e.g., OSHA, DOT, EPA, IRS)	K-9. Implement safety plan	K-10. Manage tools and equipment resources	K-11. Develop marketing plan	K-12. Implement marketing plan	K-13. Manage marketing plan	K-14. Establish policies and company procedures	K-15. Develop business succession plan	
L Pursue Professional Development	L-1. Assess training needs	L-2. Implement internal training sessions (e.g., safety, craft, equipment)	L-3. Conduct on-the-job training	L-4. Obtain out-sourced training/education	L-5. Participate in professional associations	L-6. Network with industry professionals	L-7. Obtain professional certifications (e.g., state, national)	L-8. Pursue advanced certifications (e.g., MGWC)	L-9. Enhance business skills (e.g., leadership, information systems)	L-10. Encourage employee feedback	L-11. Explore new technologies	L-12. Teach external classes and workshops				